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NEW TECHNOLOGY FOR MANUFACTURING GOLD SMALTO

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A new technology for manufacturing gold smalto using a “liquid” gold preparation has been developed. Glasses with different hues for use as substrates in preparing smalto have been synthesized in the alkali-borosilicate system. This has made it possible to expand the range of gold smalto.

The demand for gold smalto has increased in the last few years. Gold smalto is needed for restoring churches and cathedrals and their furnishings and for fabricating diverse mosaic pictures. This has become the objective reason for the resumption of smalti production.

There is only one manufacturer producing smalti, including gold smalto, for the market in European Russia today — the Experimental Laboratory of Art Glass Materials of the Russian Academy of the Arts, which has been producing smalti for centuries. The process of making the well-known Russian gold smalto is very labor-intensive. For this reason a decision was made to develop a technology for producing gold smalto based on “liquid” gold preparations and suitable for assembling face mosaics.

The objective of our work is to obtain new hues and to develop a technology for obtaining gold smalto on the basis of a glass – liquid-gold – colored-glass composition.

In the production of foil smalto, thin films of precious metals — gold, silver, or platinum — are secured to a glass surface by firing. There are several methods for depositing metal on glass. The method of gluing thin gold leaf on a cold surface has been known for a long time. Another method is to deposit powdered, brilliant, or liquid gold on glass and then fire the glass – metal composition obtained [1].

Gold foil smalto is a thin slab consisting of two glass layers between which foil is inserted and which are pressed together in a hot state (RF patent No. 2187476).

“Liquid” gold is a composition for gilding (applying a figure on) articles made of porcelain and glass. After the articles decorated with “liquid” gold are fired a brilliant gold figure is formed. The preparations can contain 10 and 12% gold metal. A 12% preparation of “liquid” gold with gold

content $12.00 \pm 0.02\%$ was used in the present work. The drying time for the “liquid” gold preparations on samples at $20 - 22^\circ\text{C}$ was 15 – 20 min. The firing was done at $580 - 590^\circ\text{C}$ with holding time 5 – 10 min at the final temperature.

A specially developed low-melting alkali-borosilicate glass was used as the substrate and cartellina (0.2 mm thick) with the same linear thermal expansion coefficient as the substrate was used as the cover layer.

The technology developed for making smalto using “liquid” gold made it possible to expand the palette of smalti hues for applications in the arts. In the course of developing this technology we were able to avoid the types of defects which are characteristic for gold-leaf based smalto, such as folds, air bubbles, and separation of the gold from the cartellina.

As a result of our investigations we have been able to synthesize glass in the alkali-borosilicate system with silicon oxide content from 62.4 to 70.8 wt.%, density $2.462 - 2.725 \text{ g/cm}^3$ (the measured values were identical to the computed values), and $\text{CLTE} (98 - 108) \times 10^{-7} \text{ K}^{-1}$.

The technological regime for making gold smalto based on a “liquid” gold preparation was developed. It was found that an ideally smooth substrate surface (cartellina) is best for depositing the preparation. A dense fine-pore sponge should be used to deposit the preparation.

Using colored glass as a substrate makes it possible to expand the palette of gold smalto, which is a product in demand on the market for glass artistic and facing materials.

The form and quality of the samples obtained were acceptable for assembling mosaics.

REFERENCES

1. A. G. Lantsetti and M. L. Nesterenko, *The Manufacture of Artistic Glass* [in Russian], Vysshaya shkola, Moscow (1987).

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